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STUDIES OF MARINE MAMMALS AT THE FARALLON ISLANDS, 1981-1982

by

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May 1983

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ABSTRACT

Observations of pinnipeds and cetaceans on or near the South Farallon Islands are reported for the thirteenth consecutive year: six years under contract to the Marine Mammal Comission and four years under contract to the National Marine Fisheries Service. Five species of pinnipeds and six species of cetaceans were censused and observed from 1 September 1981 to 30 August 1982.

The southward migration for gray whales began slowly in late November and peaked in the first week in January. The major part of the northward migration took place in early March. Up to 24 humpback whales were seen, in both spring and fall. Blue whales, killer whales, a sperm whale and finback whales were also observed.

The high rate of premature pupping among Farallon northern sea lions continued: there were 7 premature births out of 12 births in 1982. At least 3 of these premature pups were alive at birth. Blood samples were taken shortly after death and will be analyzed by Dr. Alvin Smith of Oregon State University for evidence of disease pathogens. Up to 15 bulls were observed but only 5 held territories. Two California sea lion pups were born in mid-June and observed through August. The fall peak of 2921 Zalophus was 14% higher than any previous fall count. Twenty-four tagged 1- and 2-year-old Zalophus hauled out: 15 from San Nicolas, 4 from San Miguel and 4 from San Clemente Island; all but one were males. The high count of harbor seals was 78 on 4 July, an increase of 16%. Six pups were observed but not until June; most likely they were born elsewhere. At least 12 northern fur seals hauled out on the Farallones. This includes an adult male which has been present in the summer since 1978; this year he was accompanied by a female-size animal of unknown sex for most of July.

The spring peak of molting elephant seals increased by 7% to 867 which is the lowest rate of increase since the colony began. The breeding population increased by 26% to 367 females and 163 males. Average age of parous females is now 5.5 years. Pup mortality decreased to 31% primarily due to the mild winter weather. Weaner mortality was very high--nine animals died on the island after weaning and before departing the island. Its cause remains a mystery. Of 366 animals double-tagged as pups, 5% (5/91) had lost one tag by the end of the first year, and 19% (8/42) lost one tag by the end of the second year.

INTRODUCTION

Many reports describing the wildlife of the Farallon Islands, California, have appeared since 1854 (see review by Ainley and Lewis 1974; Ainley et al. 1977a), and most have briefly mentioned marine mammals. The first real census work on Farallon pinnipeds was done by Bonnot and is summarized in Bonnot et al. (1938).

Three pinniped species (northern elephant seal, harbor seal, and California sea lion), have recently established, or seem to be in the process of establishing, breeding populations at the Farallones. A fourth species (northern fur seal) which probably was a former breeding species is increasing the frequency of its visits. This provides a unique opportunity to study comparative colonization processes by pinnipeds. A fifth species (northern sea lion) has declined in number, yielding another opportunity to learn about changes in wild population. Since biologists from the Point Reyes Bird Observatory (PRBO) are present year round on this remote natural laboratory, these opportunities are not being ignored. PRBO looks forward to maintaining a station on Southeast Farallon indefinitely, thus insuring collection of long-term data sorely needed to understand short- and long-term fluctuations in marine mammal populations. Results of studies from 1971 to 1981 are reported in Ainley et al. (1977a, 1977b, 1978) and Huber et al. (1979, 1980, 1981, 1982). Support for these studies came from the Marine Mammal Commission (1974-1980) and National Marine Fisheries Service (1978-1982).

THE FARALLON ISLANDS

Southeast Farallon and West End, shown in Figure 1, compose the South Farallon Islands or South Farallones which, with several other close-by large rocks, comprise about 44 hectares (100 acres). The North Farallones, three large rocks, lie 8 km to the north. The South Farallones lie 43 km west of San Francisco, California, and 32 km from the closest land, Point Reyes directly north, and Bolinas Point to the northeast. The islands are on the brink of the continental slope with deep oceanic waters lying immediately westward and shallow inshore waters lying eastward. The islands are positioned at the eastward edge of the cold, productive waters of the California Current.

Few other places in the eastern North Pacific provide habitation for the number and variety of wildlife that occur at the Farallones: eleven breeding species of seabirds with a combined population of over 250,000 constitute the largest seabird breeding colony in the contiguous United States; more than 325 species of birds have visited the islands; and five species of pinnipeds haul out there, at least four, and perhaps all, of which have bred on the islands. Sea otters also are said to have bred at the Farallones.

During the 1800's and through the early 1900's the Farallones were subjected to much disturbance by humans. Sealers exterminated fur seals, elephant seals, and sea otters and hunted sea lions for food (Scammon 1874; Riddell 1955; Doughty 1971). In 1854 a lighthouse was established and has been maintained continuously since. For most of that period at least four families, with their associated pets and mules, lived on the South Farallones year round. In 1854 a commercial egg company began an unregulated harvest of seabird eggs that continued until the early 1900's with apparently little regard for other wildlife. During recent years the

presence of the U.S. Coast Guard deterred visitors. The Farallones, with the exception of the South Farallones, have been a Federal Wildlife Refuge since 1900. In 1969 the South Farallones were included. Because of the island's relative remoteness, not much active protection had been practiced until PRBO personnel set up a station in April 1968. When the Coast Guard automated its equipment in 1972, PRBO entered into a cooperative agreement with the U.S. Fish and Wildlife Service under which PRBO conducts research, helps coordinate the activities of other researchers, protects island wildlife from human disturbance, and helps maintain the island's facilities. The marine bird and mammal populations have responded dramatically to the gradually lessening disturbance over the past decade (Ainley and Lewis 1974; PRBO unpubl.).

METHODS

With the exception of elephant seal censuses, little attention was paid the pinnipeds during the first few years of PRBO occupation. In 1971 and 1972, occasional counts of sea lions were made and in mid-1973 regular censuses were started. From June 1974 through August 1980, censuses were conducted under contract to the Marine Mammal Commission. Since September 1978 censuses have also been carried out under contract to the National Marine Fisheries Service.

Elephant seals have been counted regularly from blinds or from other points near their preferred haul out areas since 1970, daily during the breeding season and at least once a week during the rest of the year. Beginning in 1976, elephant seals were counted twice-weekly during spring molt and fall haul out when the greatest number of animals is present. During the seabird breeding season (from the end of May to 1 August) we counted the elephant seals from Lighthouse Hill (elevation 109 m) to minimize diturbance to both birds and seals. This census point lowers counts slightly, as portions of the seals' usual hauling out spots are not visible from Lighthouse Hill. However, few seals are present during most of that period and we consider the error relatively insignificant. Whenever possible the tag numbers of animals (tagged by PRBO and University of California personnel) were read with binoculars and recorded. Untagged animals were often recognized by individual characteristics (scars, etc.), a record of which is kept on file.

The number of harbor seals hauled out varies greatly from one day to another. Whenever observed, their numbers have been recorded; since 1973 a conscious effort has been made to find them. Beginning in 1976, they were included in weekly censuses which are conducted at low tide in order to get maximum counts.

Censuses of sea lions were made between 1400 and 1600 hours. Twelve all-day watches in which sea lions were counted revealed that maximum numbers hauled out during these hours. Weekly counts were made from Lighthouse Hill and other vantage points using a 25x spotting scope.

These counts included animals in the water.

Northern fur seals were recorded whenever observed.

Beginning in the fall of 1970, cetaceans were recorded when sighted. During the course of other activities, the ocean to the south and west of the island was watched intermittently for at least 2 hours daily, weather permitting. Cetacean sightings made by different observers (with binoculars and/or 25x spotting scopes) were totaled at the end of the day and duplicate sightings eliminated.

INDIVIDUAL SPECIES ACCOUNTS

California gray whale (Eschrichtius robustus)

Gray whales were seen in every month during 1981-82 season (Table 1). Southward bound migrants were first seen 28 November and numbers peaked on 8 January when 30 grays migrated past. As early as 10 January, grays were seen travelling north to feeding grounds in the Arctic but the bulk of the migration occurred from late February to early March. In late spring and fall several small individuals (immatures?, calves?) were seen in the company of larger grays.

In recent years from 1 to 5 recognizable grays have remained near the island for several weeks at a time throughout the year. It is probable that they are taking advantage of the food resources near the Farallones rather than travelling all the way to Arctic waters to feed. Similar behavior has been observed in grays off the coast of British Columbia (Hatler and Darling 1974).

Humpback whale (Megaptera novaeangliae)

Since 1977 we have seen humpback whales near the Farallones in both spring and fall; before then humpbacks were only observed in the fall. Spring sightings may signal the return of a resident Farallon population extirpated by whalers in the 1950's. In 1981-82 sightings increased dramatically with 46 sightings of up to 24 whales (Table 2). Four of these sightings were of a large animal with a smaller animal nearby (cow and calf?). Many of the sightings were of animals which remained near the island, presumably feeding. One observation was of a humpback defecating; the feces were red-pink.

Blue whale (Balaenoptera musculus)

In late summer and fall of 1981 we observed blue whales on five occasions; these were the first sightings of blue whales from the Farallones since PRBO's observations began in 1970. One to three blues were seen betweeen 10 June to 27 August 1982 (Table 3). Birdwatching and whalewatching boats around the Farallones have also noted increased

sightings of blue whales in the last year. This may be a foreshadowing of an increase in the blue whale population.

Other cetaceans

There were 3 sightings of killer whales (Orcinus orca) in fall 1981 (Table 4), one sperm whale observed on 25 June (Table 5) and two fin back whales seen on 5 August.

We observed but were unable to identify whales in 19 sightings.

Northern (Steller) sea lions (Eumetopias jubatus)

The yearly population fluctuations of Northern (Steller) sea lions in 1981-82 were similar to recent years (Figure 2, Table 6) with a peak of animals during the breeding season. This pattern parallels that of the Ano Nuevo population 89 km south (Orr and Poulter 1967; Gentry 1970). Population numbers remained similar to previous years.

The high rate of premature births continued (Table 7); seven females pupped prematurely between 1 April and 18 May. At least 3 pups were alive at birth. We retrieved two pups within an hour of death and took fresh blood samples from them. The blood will be analyzed by Dr. Alvin Smith of Oregon State University for evidence of disease pathogens. Pup mortality due to premature pupping was 58%. Five full-term pups were born in the last 2 weeks of June; one of these died of unknown causes. For the first time in six years a pup was seen on Saddle Rock, formerly the major pupping area.

The first adult male arrived at the end of April and the last bull departed by 1 August. Five bulls held territories. We have observed an increased number of bulls and sub-adult males in the last 2 years, with up to 15 bulls and 27 subadult males present at censuses in 1982. The subadult males were not observed throughout the breeding season - numbers fluctuated from 5 to 27 during June and July. One subadult male was seen on both the Farallones and the Pt. Reyes mainland in June.

We censused the North Farallones in late June but saw no pups. In January we observed 2 females with fresh shark wounds and resighted a female which pupped on the Farallones in 1980.

California sea lion (Zalophus californianus)

The numbers of California sea lions hauled out on the Farallones in the fall increased again in 1981 when 2921 Zalophus were counted on 8 October. Two peaks occur in the Farallon population - spring and fall during migration to and from large southern rookeries (Fig. 3))Table 8). In the last two years, tagging effort on the Channel Islands has increased and consequently more tagged Zalophus pups are hauling out on the Farallones.

In 1982, 24 tagged immatures (1 and 2 year olds) hauled out: 15 from San Nicolas Island, 4 from San Miguel Island, and 4 from San Clemente. All but one were male (Heath, Oliver, DeLong pers. comm.).

Seven individuals tagged by the Marine Mammal Rehabilitation Center and released near the Farallones remained on the Farallones for from 1 to 14 days (Dierauf pers. comm.).

For the first time since pupping began on the Farallones in 1974, two pups were born on the SW side of the Island. They were born in mid-June and observed through August.

As the number of migrating Zalophus increases, the areas in which they haul out also increase. Many Zalophus now frequent the south and east sides of the island (Fig. 1) in traditional harbor seal and elephant seal areas. In May during the bird breeding season, the presence of Zalophus hauled out high on the rocks displaced Common Murres and Brandt's Cormorants from their usual nesting sites.

During the year we noticed 5 medium-sized California sea lions with fishing net wrapped around their necks, 2 with fishing lines, and 2 with salmon lures embedded in their mouths.

We saw 5 Zalophus with shark wounds, 3 of them fresh bites (in February and March).

Harbor seal (Phoca vitulina)

The harbor seal population on the Farallones increases each year; high count was 78 animals hauled out on July 4, an increase of 16%. Peak numbers generally occur in summer when harbor seals are dispersing after their annual molt (Fig. 4) (Table 9). Six pups were seen sporadically in June and July; it is most likely they were born elsewhere.

Northern fur seal (Callorhinus ursinus)

Since fur seals began hauling out regularly on the Farallones in 1977, their appearences have become more frequent each year, so that in 1981-82 we saw fur seals in every month except November. At least 12 individuals hauled out, including the adult male which has hauled out every summer since 1978. This year he arrived 31 May and remained until 24 July and was accompanied by a female-sized animal of unknown sex for most of July.

A second adult male was observed for a week in August.

The majority of the fur seal population breeds on islands in the Bering Sea but a small breeding colony was discovered on the Channel Islands in the mid-1960's. It is the presence of this disjunct colony on the Channel Islands, the probable breeding of this species on the Farallones in the

past, and the steadily increasing numbers of returning individuals which make us think the Farallones may become a northern fur seal breeding colony.

Northern elephant seal (Mirounga angustirostris)

The northern elephant seal, recovering from near extinction at the hand of sealers in the 1800's, has slowly recolonized its former range since Mexican and U. S. government protection began in the 1920's. Reduced to fewer than 100 animals at the turn of the century, the population has grown to nearly 60,000. The first elephant seal on the Farallones, after a hiatus of more than 150 years, was seen in 1959. Breeding began in 1972.

Censuses

During the year there are two peaks in the numbers of elephant seals on the Farallones. In the early years the fall peak exceeded the spring peak but as the colony matured, the spring peak, when adult females and immatures haul out, surpassed the fall peak, when only immatures haul out. In 1981-82 the number of animals present in the breeding season increased so that it surpassed the usual fall peak (Table 10, Fig. 5). The spring peak of 867 animals on 15 April was an increase of only 7% over the previous year's high count, perhaps indicating a leveling off in colony growth. The growth of the Farallon colony is still primarily due to immigration of young animals from the southern rookeries. Most of the immigration is from San Miguel Island (Table 11). Only 18% of the breeding population on the Farallones is animals tagged as pups on the Farallones.

Breeding Season 1982

The breeding population increased by 26% again in 1982 with 367 females pupping and 163 males present (Table 12). Pup mortality was reduced to 31% (112/367) because the unusual severe storms, which hit in late January when pups are young and vulnerable, did not occur.

The breeding chronology was similar to previous years (Table 13). For the last two years bulls have begun to arrive in mid-November rather than late November. The number and percent of older males increased again this year (Table 14), another indication of the maturity of the colony.

The alpha bull on the Sand Flat accomplished 48% (185/389) of the observed copulations (Table 15). He has been a high-ranking subordinate bull for the previous 3 years and was first observed as a 5-year-old in 1977. The alpha bulls of 1981 and 1982 both "grew up" on the Farallones, first appearing as 5- or 6-year-olds, rather than as immatures, as did the bulls in the first few years of the colony. An 8-year-old Farallon-born male was dominant bull on one of the smaller West End beaches. Slightly over half (10/18) of the Farallon-born cows pupped in West End, although all but one were born on Southeast Farallon. The age of females pupping on

Southeast Farallon is 5.9 years, compared to 4.9 years for West End.

Female reproductive rates

Out of 123 adult females pupping for 3 to 8 years, we found 67% pupped every year, 27% missed one pupping season, and 6% skipped two years. The pupping sequence for 88 cows for four consecutive years between 1976 and 1982 is shown in Table 16. The average pupping rate ranged from .84 to .92. When we analyzed these same females to determine whether they raised a pup successfully to weaning or not, the rate of pups actually raised to weaning (.51 to .75) (Table 17) was much lower than the pupping rate. The pupping rate for primiparous 3-year-olds for four consecutive years was .73, for primiparious 4-year-olds it was .83, and for primiparous 5-year-olds it was .92. When we analyzed data for the first two years of pupping for known-age primiparous females, we found a significant difference in pupping rate ($p<.01$) and weaning rate ($p<.05$) for females pupping at age 3, 4, or 5.

It has been suggested that the reproductive potential of female elephant seals is enhanced by early maturity, in that if a female begins to pup at age 3, she has the potential of producing two more offspring in her lifetime than the female that delays pupping until age 5, and that even if she fails to raise her first pup successfully, in attempting to breed she has gained experience which will increase her probability of raising a pup successfully in her 4th year (Reiter et al. 1981). On the Farallones we found that of 21 three-year-olds that began pupping between 1975 and 1979, only 9% (2) pupped for four consecutive years, whereas for 4- and 5-year-olds, the percent of continuous breeders was 50% and 80%. Thus, a female which begins pupping at age 3 does not necessarily increase her reproductive potential. On the contrary, a female that delays pupping until age 5 may actually increase her reproductive success.

Pup Mortality

For the first time in 6 years, pup mortality decreased on the Farallones to 31% (112/367) (Table 18). Two years of low mortality, 1976 and 1982, were characterized by a lack of storms during the height of the breeding season. In 1982, mortality was decreased in all areas except Shell Beach, but it was most markedly reduced in the beach areas where in the past pups were washed away by combinations of storms and high tides (Table 19). The number of pups born on Shell Beach increased from 53 in 1981 to 108 in 1982, and mortality from 23% to 36%, increasing West End pup mortality to 32%. Storms, increased density, and the chaos resulting from males, females, and pups trying to get near the water on hot, calm days have been the major causes of increased pup mortality on the Farallones in the past.

Weaner Mortality

Each year a few pups die between weaning and departing the island (Table 20). In 1982, 8 weaners died between 26 March and 21 April. Five of these were necropsied and we found the same symptoms in all cases: extensive blood in body cavities, some blood in nose, throat, anus. All animals were found on hot, calm days. Crushing by adult males was at first suspected, but all large males had left the area 3-4 days before the weaners died. Two yearlings with the same symptoms were found on 21 April within a few feet of a dead weaner. The cause of these deaths is still a mystery, but it is possibly Leptospirosis, which causes extensive hemorrhaging in its victims.

Tag Loss

Between 1978 and 1981 (except 1979 when permit complications reduced tagging effort), 90% (366/409) of all weaned pups were tagged with two pink jumbo rototags (one in each hind flipper) in order to assess tag loss. Preliminary analysis of 366 animals double-tagged as pups shows that 5% (5/91) had lost one tag by the end of the first year and 19% (8/42) had lost one tag by the end of the second year (Table 21). Tag loss has previously been estimated at about 5% (Le Boeuf 1974). By taking into account the probability that a single-tagged or double-tagged animal would lose all its tags, we estimated a new survival rate for pups (Table 22).

We also looked at tag loss in animals tagged as adults. Since 1974 we have tagged 275 adult females (3 yrs+) and 277 adult males (5 yrs+) (Table 23). Of these, we have recovered tags of 88 males and 46 females. Table 24 shows amount of time that elapsed before tag loss occurred for males and females; a significantly greater number of males than females lost tags within the first month, but after the first year tag loss was similar.

Tag Returns

We tagged 372 elephant seals in 1982, primarily during the breeding season (Table 23). Most of these were weaned pups. Minimum survival rates for pups tagged between 1974-1981 are found in Table 25. From 1975-1979, survival to the first fall was about 40%, which is similar to the rate found at Ano Nuevo Island (Reiter et al. 1981); in 1980 and 1981 the rate dropped by nearly half. Even when corrected for tag loss (Table 22), the numbers are still lower than in previous years and may be caused by differential mortality for that cohort or difficulty in reading tags in more crowded circumstances.

Eighteen Farallon-born cows pupped on the Farallones in 1982 (Table 26) (none were observed to pup elsewhere). Their average age was 5.1. Eighty alien-born females pupped: 36 from San Miguel Island, 5 from San Nicolas, and 39 from Ano Nuevo Island. Their average age was 5.6 (Table 27). On Ano Nuevo, an established rookery, the average age is between 5.2 and 5.6 (from

data in Reiter et al. 1981). The average age for both groups may appear slightly higher than it really is because an entire age-class (3 yr. olds) is missing due to reduced tagging effort in 1979. The 1976 cohort, on the other hand, continues to be a very strong group.

In April a healthy 1982 pup was found in Martinez in San Francisco Bay, about 35 miles from the ocean. It was picked up by the Marine Mammal Rehabilitation Center and released near the Farallones.

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Table 1. Number of gray whales seen from South Farallon Islands, 1981-82.

Date 1981	Minimum Number	Direction of Travel N	S	E	W	Remain near island
Sept 25	2				2	
26	1					1
27	1					1
28	1					1
29	3		2			1
30	1					1
Oct 1	1					1
2	1				1	
3	1					1
14	1					1
16	2					2
17	2					2
21	2					2
25	1					1
26	1					
28	1		1			
29	2					
30	1					1
31	1					
Nov 1	1					
2	1					
4	1					
6	2					
7	1					
8	1					
11	3		3			
13	1	1				
14	1		1			
17	7		3			
18	2					
19	3					3
20	1		1			
25	7					
26	2					
27	1					1
28	7		4			
29	2					
30	4					
Dec 1	4		1			2
2	8+		5			1
3	3					
4	1					
5	1					
7	3		2			1
8	2					
10	1					1

Table 1 (cont.)

Number of gray whales seen from South Farallon Islands, 1981-82.

Date		Minimum Number	Direction of Travel N	S	E	W	Remain near island
Dec	11	1					1
	12	1					
	15	1		1			
	16	3					3
	17	2					
	20	2		2			
	22	1					
	23	1					
	24	4		4			
	26	1					1
	27	2					2
	28	22		22			
	29	2					
	30	13		10			1
	31	1		1			
1982							
Jan	1	10		10			
	2	1					
	3	11		9			2
	5	12	3	8			1
	6	23+		22			1
	7	23+		18			5
	8	30		27			2
	9	28+		27			
	10	15		15			
	11	4		3			
	12	6		4			2
	13	28		10+			
	14	12		8			
	15	1					
	16	3					
	17	1					
	18	3	2				
	19	1					
	22	2					2
	24	12					
	25	1					1
	26	1					1
	27	2					
	28	1					
	30	1					
Feb	1	1					
	2	5					
	3	3					
	4	1					1

Table 1 (cont.)

Number of gray whales seen from South Farallon Islands, 1981-82.

Date	Minimum number	Direction of Travel N	S	E	W	Remain near island
Feb 5	1					1
6	1					1
7	1					1
8	4					1
9	3					2
10	1					1
11	3					1
12	3					1
13	1					1
16	1					
17	2					2
18	4					2
20	1					
21	2					
23	2					1
24	2					2
25	4	3				1
26	1					
27	10	8				2
28	2					1
March 1	2					
2	3+	2				
4	2+					1
5	3					1
7	4	3				
9	3+					1
10	1					
13	1					
14	3					
15	1					
16	1					1
18	2+					
19	2					
20	4					2
21	1					1
22	5					3
23	2					1
24	1					1
25	5					1
26	2					2
27	3					1
28	2					2
29	1					
31	1					
April 1	2					1
3	2					

Table 1 (cont.) Number of gray whales seen from South Farallon Islands, 1981-82.

April	4	2			
	6	7			
	7	5+			
	8	5+			
	9	1			1
	11	1			1
	12	1			1
	13	1			1
	14	2			1
	15	1			
	17	1			
	18	1			
	19	2			1
	20	2			2
	21	3			2
	22	3			2
	23	3			3
	24	5			
	25	3			1
	26	1	1		
	27	3	3		
	30	1			1
May	1	2	1		
	2	1			
	3	4			
	4	2			2
	5	2			1
	6	3			1
	7	1			
	10	2			2
	11	2			
	12	2			1
	13	2			2
	14	1			
	16	1			
	17	1			
	18	1			
	19	1	1		
	21	1			
	22	2			
	23	2			2
	24	2			
	25	2			
	26	1			
	27	3			
	28	3	2		
	30	1			
	31	1			
June	2	2			
	3	2			
	9	1			1
	12	2			

Table 1 (cont.) Number of gray whales seen from South Farallon Islands, 1981-82.

Jun	13	1		
	14	1		
	15	1		
	16	1		1
	18	2		1
	19	3		1
	20	1		
	21	1		1
	22	2		
July	10	1		
	16	1		
	17	1		
	18	1		
	19	1		
	20	2		
	21	1		
Aug	29	4	4	
Sept	18	1		1
	20	1		1
	21	1		1
	22	3		3
	23	2	2	
	24	1		
	25	2		2
	27	1		
	28	1		1

Table 2. Sightings of humpback whales from South Farallon Islands, 1981-82.

Date	Total	Remarks
1981		
Sept 8	3	3/4 mile SE, spyhopping
9	2	SE of island
13	1	
16	2	
17	1	travelling north
18	4+	
19	4	
23	2	
24	12	near island most of day
25	6	2-3 miles S of island, moving SW
28	8	3 seen 1/2 mile E, moving North 5 seen 1/2 mile E, moving North
Oct 5	2	2 miles NW, observed for 5 hours, 1 large, 1 smaller (cow and calf?)
14	1	1/4 mile E, moving NW
1982		
May 6	4	1 mile E, breaching
13	2	1 mile E, breaching
15	2	1/2 mile E, moving north
27	3	2 large, 1 smaller, seen for 40 minutes
29	1	100 yds E
30	2	1/2 mile E
June 4	3	1/4 mile E, 1 large, 1 smaller
18	2	
19	2	
20	3	5 miles E
21	3	around island all day
23	2	
24	2	1 mile SW, breaching, moving NW
25	9+	
26	5+	
27	7+	
28	3+	2 whales 1/2 mile E, moving N
July 4	1	1 mile E, breached, moved N
18	3	1-2 mile NE of island
25	2	3 miles SE of island
Aug 2	2	1/2 mile SE, defecated, feces red-pink in color
13	2	1 to 2 miles E of island
16	6 - 8	3 moving rapidly NW
17	5 - 8	
20	2 - 4	
22	2	8 miles East of island
24	3	2 miles South of island
26	2	1 mile South of island
27	2	4 miles North
28	17	all 2 miles S, in pods of 2 to 4
29	12+	10 in 5 pods of 1, ovepod = cow and calf?
30	24	4 to 6 miles NE, in pods of 2 of 4

Table 3. Sightings of blue whales from South Farallon Islands, 1981-1982.

Date	Total	Remarks
1981		
Sept 25	1	2 to 5 miles NW of island,seen for 2-1/2 hours.
30	5	
1982		
June 20	3	3 miles east of island.
Aug 9	2	1 mile SE of island,observed for 1 hour.
Aug 10	2	1/2 to 1 mile East of island, observed for 1 hour.
Aug 11	2	2 miles north of island, moving north.
Aug 27	1	3 miles SW of island.

Table 4. Sighting of killer whales from South Farallon Islands, 1981-1982.

Date 1981	Total number	Remarks
Sept 26	1	1/2 mile E of island, moving west, immature male or female.
Oct 8	2	1 1/2 miles W of island, moving west, both adult males.
Nov 15	2	1/4 mile S of island, adult male and female or immature.

Table 5. Sightings of other cetaceans from South Farallon Islands, 1981-1982.

Date 1982	Total number	Remarks
June 25	1	sperm whale - 4 - 5 miles W of island, observed for 3 hours.
August 5	2	finback whales - 3/4 mile SE of island

There were 19 sightings of unidentified whales between 10 Sept 1981 and 4 Sept 1982.

Table 6. Weekly census of Steller (northern) sea lions on S. E. Farallon Islands, 1981-1982.

Date 1981	Total number	Adult males	Subadult males	Probable females	Immatures	Yearlings	Pups
Sept. 3	24		1	8	11	3	1
Sept. 11	48		1	23	19	4	1
Sept. 18	27			16	2	5	4
Sept. 25	30			16	7	3	4
Oct. 1	37			20	8	1	8
Oct. 8	49			28	8	4	9
Oct. 15	33			19	5	3	6
Oct. 26	49			26	18		5
Oct. 29	80			47	22	10	6
Nov. 5	54			26	5	9	6
Nov. 19	62			52	1		10
Nov. 26	82		1	39	19	19	4
Dec. 4	70			39	21	1	9
Dec. 10	97			49	13	17	18
Dec. 17	68			38	7	8	15
Dec. 24	97			50	14	8	25
Jan. 1	62			37	10	15	
Jan. 6	129		1	71	27	30	
Jan. 14	54			24	12	18	
Jan. 22	74			44	15	15	
Jan. 28	59			33	11	15	
Feb. 4	69			22	8	13	
Feb. 12	42			25	11	6	
Feb. 18	82			43	14	25	
Feb. 25	77		1	45	14	17	
Mar. 4	74			46	13	15	
Mar. 11	52		1	27	11	13	
Mar. 18	89			28	17	10	
Mar. 25	86			42	28	16	

Table 6 (cont.) Weekly census of Steller (northern) sea lions on S. E. Farallon Islands, 1981-1982.

Date 1982	Total number	Adult males	Subadult males	Probable females	Immatures	Yearlings	Pups
Apr. 1	88			50	27	11	
Apr. 8	66			41	16	9	
Apr. 15	83			56	14	13	
Apr. 23	38			27	5	6	
Apr. 29	34		1	20	6	7	
May 6	40	6		20	10	4	
May 13	74	3	3	42	14	12	
May 21	147	7	8	78	26	28	
May 27	154	5	11	94	18	26	
June 3	176	5	2	91	16	19	
June 10	160	15	5	99	17	24	
June 17	144	11	7	95	30		
June 24	192	15	12	119	20	24	2
July 1	138	11	27	51	45	21	2
July 8	154	13	20	63	39	16	3
July 15	97	5	8	52	23	6	3
July 22	70	8	4	38	13	6	3
July 29	59	2	7	30	13	5	3
Aug. 5	26		4	13	9		
Aug. 13	82		2	58	19		3
Aug. 19	78			54	22		3
Aug. 26	64		5	39	19		3

Table 7. Reproductive success of female Steller (northern) sea lions on S.E. Farallon Island, 1973-82.

Year	Highest number of females present	Number of pups born	Percent natality	Number of premature births	Pup deaths- other causes	Percent mortality
1973	73	9	12	3	-	33
1974	110	10	9	4	-	40
1975	98	19	19	4	5	47
1976	98	14	14	5	1	43
1977	111	27	24	11	-	41
1978	103	18	17	10	-	56
1979	96	15	15	3	3	40
1980	91	26	29	14	2	61
1981	86	17	20	11	-	64
1982	99	12	12	7	1	67

Table 8. Weekly censuses of California sea lions on South Farallon Islands, 1981-1982.

Date 1981	Total number	Males	Female -size	Immatures	Pups
Sept. 3	991	294	669	28	
Sept. 11	1527	390	1073	64	
Sept. 18	1537	611	863	63	
Sept. 25	1703	618	1023	62	
Oct. 1	2054	466	1492	96	
Oct. 8	2921	573	1657	239	
Oct. 15	2907	1181	1634	92	
Oct. 26	815	121	673	71	
Oct. 29	1018	415	557	46	
Nov. 5	628	213	307	37	
Nov. 14	1071				
Nov. 19	1122	295	699	128	
Nov. 26	1164	441	655	68	
Dec. 5	1773	204	------992------		
Dec. 10	1823	380	1250	193	
Dec. 17	1126	301	727	98	
Dec. 24	1588	412	1056	120	
Jan. 1	1058	272	721	65	
Jan. 7	2027	475	1409	143	
Jan. 14	898	335	511	52	
Jan. 22	1233	99	1069	65	
Jan. 28	1080	215	820	45	
Feb. 4	2127	905	1066	156	
Feb. 12	1369	225	944	200	
Feb. 18	1701	330	1226	145	
Feb. 25	1820	812	871	137	
Mar. 4	1207	338	750	119	
Mar. 11	920	162	675	83	
Mar. 18	905	105	738	62	
Mar. 25	1549	213	1262	74	

Table 8(cont.) Weekly census of California sea lions on South Farallon Islands, 1981-1982.

Date 1982	Total number	Males	Female -size	Immatures	Pups
Apr. 1	1456	250	1090	116	
Apr. 8	2113	319	1652	142	
Apr. 15	1542	242	1152	148	
Apr. 23	1898	776	1024	98	
Apr. 29	2542	614	1424 (318)	186	
May 6	2755	996	1251	149	
May 13	2675	1196	1320	156	
May 21	2522	613	1759	150	
May 27	2323	1082	1071	170	
Jun 3	1726	766	875	85	
Jun 10	1862	302	1514	44	
Jun 17	1004	195	727	82	1
June 24	1022	237	743	38	2
Jul 1	1647	15	1618	13	2
Jul 8	1897	72	1766	55	2
Jul 15	1836	449	1298	89	2
Jul 22	1768	517	1116	138	2
Jul 29	2636	704	1765	167	2
Aug 5	1613	407	836	270	2
Aug 13	2303	374	1690	239	
Aug 19	2629	526	1870	233	
Aug 26	2439	328	1586	524	1

Table 9. Weekly censuses of harbor seals on South Farallon Islands, 1981-1982.

Date		Total Number
1981		
Sept	3	39
	16	43
	24	29
	29	26
Oct	5	26
	10	29
	13	41
	23	34
Nov	3	33
	10	24
	19	31
	25	20
Dec	7	31
	15	27
	20	39
	24	41
1982		
Jan	1	23
	7	47
	14	22
	23	29
Feb	2	24
	7	26
	17	30
	20	39
	25	31
Mar	4	40
	11	36
	16	48
	22	50
	25	40

Date		Total Number
1982 (cont.)		
Apr	4	52
	8	52
	18	52
	23	50
	29	46
May	3	65
	10	57
	18	46
	23	47
June	3	55
	7	53
	17	51
	21	65
	22	73
July	1	70
	4	78
	12	67
	21	69
	25	54
Aug	1	35
	11	37
	24	31
	27	27

Table 10. Weekly censuses of northern elephant seals on South Farallon Islands, 1981-1982.

Date		Total number
1981		
Sept	3	102
	11	89
	18	209
	25	370
Oct	1	384
	8	502
	15	534
	23	477+
	29	529+
Nov	5	410
	14	356
	19	417
	26	401
Dec	4	429
	10	335
	17	314
	24	309
1982		
Jan	1	292
	6	321
	14	452
	22	616
	28	666
Feb	4	649
	12	585
	18	502
	25	374
Mar	4	368
	11	290
	18	244
	25	379

Date		Total number
1982 (cont.)		
Apr	1	505
	8	787
	15	867
	23	634+
	26	797
May	6	487
	13	509
	21	571
	27	403
June	4	189
	10	169
	17	94
	24	46
July	1	53
	9	52
	15	53
	22	73
	29	65
Aug	5	80
	13	42
	19	64
	26	70

Table 11. Island of birth for tagged elephant seals on South Farallon Islands, 1982.

	Farallones	Ano Nuevo	San Miguel	San Nicolas	Total
No. of Females	18	39	36	5	98
No. of Males	7	10	18	4	39
	25	49	54	9	137
	18%	35%	39%	7%	

Table 12. A summary of animals involved in elephant seal breeeding seasons on the South Farallon Islands, 1972-1982.

Year	Number of bulls*	Number of breeding males	Number of females present	Number of pups born	Percent increase	Pups weaned
1972	0	1	2	1		1
1973	0	1	3	2	100%	2
1974	7	1	19	17	750	5
1975	8	3	37	35	105	28
1976	6	5	62	60	71	56
1977	2	10	111	104	73	84
1978	2	18	143	133	30	99
1979	6	25	194+	184+	38	128
1980	11	22	236+	232+	26	136
1981	15	22	300+	292+	26	172
1982	24	33	375+	367+	26	255

* as defined in Table .

ble 13. Breeding chronology for elephant seals on South Farallon Islands, 1972-1982.

	Bulls		Cows		Pupping
ear	Arrival	Departure	Arrival	Departure	
972	6 Feb.	16 Feb.	20 Jan.	12 Feb.	20 Jan.
973	13 Jan.	16 Feb.	13-14 Jan.	10-12 Feb.	17-19 Jan.
974	27 Nov.-18 Jan.	28 Jan.-23 Mar.	2-28 Jan.	9 Feb.-16 Mar.	15 Jan. 6 Feb.
975	26 Nov.-17 Jan.	13 Feb.-15 Mar.	25 Dec.-4 Feb.	27 Jan.-11 Mar.	31 Dec.-10 Feb.
976	1-22 Dec.	24 Feb.-11 Mar.	20 Dec.-4 Feb.	21 Jan.-7 Mar.	28 Dec.-10 Feb.
977	19-27 Dec.	10-13 Mar.	20 Dec.-17 Feb.	18 Jan.-14 Mar.	25 Dec.-18 Feb.
978	6-23 Dec.	10-21 Mar.	19 Dec.-12 Feb.	18 Jan.-13 Mar.	23 Dec.-15 Feb.
979	26 Nov.-4 Jan.	28 Feb.-25 Mar.	14 Dec.-13 Feb.	20 Jan.-17 Mar.	20 Dec.-17 Feb.
980	25 Nov.-1 Jan.	25 Feb.-24 Mar.	18Dec.-20 Feb.	22 Jan.-26 Mar.	27 Dec.-26 Feb.
981	16 Nov.-22 Dec.	13 Feb.-25 Mar.	18 Dec.-17 Feb.	17 Jan.-19 Mar.	24 Dec.-18 Feb.
982	15 Nov.-30 Dec.	17 Feb.-23 Mar.	20 Dec.-22 Feb.	16 Jan.-18 Mar.	24 Dec.-24 Feb.

Table 14. Age classes of male elephant seals during the breeding season on South Farallon Islands, 1976-1982.

Age class	SA (5 yrs)	SA (6-7 yrs)	SA (7-8 yrs)	Bull (8+ yrs)	Total # males
1976	10 (46%)	6 (27%)	0	6 (27%)	22
1977	18 (50%)	15 (42%)	1 (3%)	2 (6%)	36
1978	26 (54%)	16 (33%)	4 (8%)	2 (4%)	48
1979	34 (47%)	19 (26%)	13 (18%)	6 (8%)	72
1980	32 (34%)	39 (41%)	13 (14%)	11 (12%)	95
1981	62 (47%)	33 (25%)	21 (16%)	15 (11%)	131
1982	66 (40%)	39 (24%)	33 (20%)	25 (15%)	163

Table 15. Breeding success of male elephant seals on S. E. Farallon Island, 1982.

Specimen Number	Age	Copulations Observed	% of total copulations	Period of copulations
163	bull	185	48	17 Jan.-2 Mar.
585	bull	58	15	19 Jan.-25 Feb.
1490	bull	33	8	1 Feb.-26 Feb.
933	bull	18	5	24 Jan.-19 Feb.
729	bull	12	3	31 Jan.-15 Feb.
671	SA	10	3	27 Jan.-21 Feb.
574	bull	9	2	4 Feb.-20 Feb.
491	bull	7	2	21 Jan.-21 Feb.
663	SA	7	2	2 Feb.-10 Feb.
948	bull	6	2	6 Feb.-25 Feb.
1188	bull	6	2	10 Feb.-18 Feb.
51	SA	5	1	2 Feb.-25 Feb.
676	SA	5	1	2 Feb.-10 Feb.
923	SA	5	1	8 Feb.-17 Feb.
1111	SA	4	1	2 Feb.-25 Feb.
564	bull	3	<1	1 Feb.-25 Feb.
1500	SA	3	<1	4 Feb.-10 Feb.
472	bull	2	<1	6 Feb.-10 Feb.
670	SA	2	<1	11 Feb.-12 Feb.
1191	SA	2	<1	10 Feb.-20 Feb.
1504	SA	2	<1	11 Feb.-20 Feb.
603	SA	1	<1	1 Feb.
694	SA	1	<1	21 Feb.
1185	SA	1	<1	21 Feb.
1481	SA	1	<1	29 Jan.
1488	SA	1	<1	20 Feb.
		389		

Table 16. Pupping histories of adult female elephant seals for four consecutive years (data from 1976 to 1982).

i	Pupping sequence	No. of pups produced by female following pupping sequence after initial year	1976 No. of cows	1976 No. of pups in 3 yrs.	1977 No. of cows	1977 No. of pups in 3 yrs.	1978 No. of cows	1978 No. of pups in 3 yrs.	1979 No. of cows	1979 No. of pups in 3 yrs.	All years No. of cows
1	P P P P	3	15	45	17	51	14	42	13	39	59
2	P P P 0	2	1	2	2	4	2	4	1	2	6
3	P P 0 P	2	4	8	3	6	2	4	1	2	10
4	P 0 P P	2	0		0		4	8	7	14	11
5	P P 0 0	1	1	1	0		2	2	0		3
6	P 0 P 0	1	0		0		0	0	0		0
7	P 0 0 P	1	0		0		2	2	1	1	3
8	P 0 0 0	0	0		0		0		0		0
9	0 P P P	3	1	3	0		0		0		1
10	0 P P 0	2	0		0		0		0		0
11	0 P 0 P	2	0		0		0		0		0
12	0 0 P P	2	0		0		0		0		0
13	0 P 0 0	1	0		0		0		0		0
14	0 0 0 P	1	0		0		0		0		0
15	0 0 0 P	1	0		0		0		0		0
16	0 0 0 0	0	0		0		0		0		0
			22	59	22	61	26	62	23	58	
			$\frac{59}{66} = .89$		$\frac{61}{66} = .92$		$\frac{62}{78} = .79$		$\frac{58}{69} = .84$		

$$\text{Average pupping rate} = \frac{\sum_{i=1}^{16} (\#\text{ of pups in 3 yrs.})i \quad \text{total } i}{3 \sum_{i=1}^{16} (\text{total } i)} = \frac{240}{279} = .86$$

Table 17. Weaning histories of adult female elephant seals for four consecutive years (data from 1976 to 1982).

i	Weaning sequence	No. of pups weaned by female following weaning sequence i after initial year	OBSERVATIONS BEGINNING 1976 No. of females	1976 No. of weaned pups in 3 yrs.	1977 No. of females	1977 No. of weaned pups in 3 yrs.	1978 No. of females	1978 No. of weaned pups in 3 yrs.	1979 No. of females	1979 No. of weaned pups in 3 yrs.	All Yrs. No. of females
1	S S S S	3	8	24	2	6	2	6	4	12	16
2	S S S U	2	1	2	3	6	0		2	4	6
3	S S U S	2	5	10	4	8	1	2	0		10
4	S U S S	2	2	4	1	2	2	4	5	10	10
5	S S U U	1	3	3	1	1	1	1	0		5
6	S U S U	1	0		1	1	1	1	0	0	2
7	S U U S	1	0		1	1	1	1	1	1	3
8	S U U U	0	0		0		1	0	0		1
9	U S S S	3	1	3	1	3	1	3	2	6	5
10	U S S U	2	1	2	2	4	2	4	1	2	6
11	U S U S	2	1	2	1	2	2	4	0		4
12	U U S S	2	0		0		0		3	6	3
13	U S U U	1	0		0		0		0		0
14	U U S U	1	0		4	4	1	1	1	1	6
15	U U U S	1	0		0		3	3	2	2	5
16	U U U U	0	0		0		1	0	2	0	3
			22	50	21	38	19	30	23	44	85
			$\frac{50}{66} = .75$		$\frac{38}{63} = .60$		$\frac{30}{57} = .53$		$\frac{44}{69} = .63$		

$$\text{Average weaning rate} = \frac{\sum_{i=1}^{16} (\#\text{ of pups in 3 yrs.})i}{\sum_{i=1}^{16} 3 \text{ total } i)} = \frac{\text{total } i}{\frac{162}{255}} = .63$$

Table 18. Elephant seal pup mortality to weaning 1974-1982 on South Farallon Islands.

Year	Number of pups born	Number of pups died	Percent mortality	Causes of Death						
				Crushed by male	Bitten, abandoned	Drowned	Fell off cliff	Stillborn	Other	Unknown
1974	17	12	71	0	8	2	0	1	1	0
1975	35	7	20	2	0	3	1	1	1	0
1976	60	4	7	1	1	1	0	1	0	0
1977	104	20	19	5	7	6	0	2	0	0
1978	133	34	26	7	7	0	3	1	2	5
1979	184	56	30	10	14	5	8	1	1	17
1980	232	96	41	20	11	21	18	1	1	24
1981	292	120	42	16	11	21	17	2	1	42
1982	367	112	31	17	7	17	11	2	0	58

Table 19. A comparison of pup mortality to weaning in different areas on South Farallon Islands, 1981 and 1982.

	1981			1982		
	# pups born	# pups died	% mortality	# pups born	# pups died	% mortality
Southeast Farallon						
Mirounga Beach	34	23	68	30	11	36
Sand Flat	148	60	40	140	27	20
North Landing	3	3	100	8+	4	50
Marine Terrace	8	1	12	4	0	0
Sea Lion Cove	6	4	66	3	2	66
West End						
Mirounga Valley	4	2	50	19	6	31
Indian Head	16	7	43	24	5	21
Pastel Cave	16	5	31	24	6	25
Shell Beach	53	12	23	108	39	36

Table 20. Weaner mortality in northern elephant seals on South Farallon Islands, 1976-1982.

Year	Number dead			Dates of deaths
	M	F	Total	
1976		1	1	15 March
1977	2	1	3	14 Feb - 15 March
1978	1		1	6 March
1979			0	
1980	2	1	3	19 Feb - 9 April
1981	1		1	9 March
1982	4	5	9	2 March - 21 April

Table 21. Tag loss from elephant seals double-tagged as pups on South Farallon Islands 1978, 1980, 1981.

	1978		1980		1981		Total
No. of pups doubled-tagged	N = 91		N = 126		N = 149		N = 366
	Observed with one tag	both tags	one tag	both tags	one tag	both tags	Percent tag loss
Second spring	0	23	1	25	4	38	5/91 = 05%
Third spring	0	18	8	16			8/42 = 19%
Fourth spring	1	15					1/16 = 06%
Fifth spring	2	10					2/12 = 17%

Table 22. Survival of elephant seals (corrected for tag loss) tagged as pups on South Farallon Islands 1978, 1980, 1981.

YEAR	1978			1980			1981		
	minimum survival rate	est.no. animals that lost all tags	corrected survival rate	minimum survival rate	est. no. animals that lost all tags	corrected survival rate	minimum survival rate	est. no. animals that lost all tags	corrected survival rate
Second spring	.293	.62	.298	.185	.91	.189	.130	1.52	.135
Third spring	.173	4.8	.209	.121	6.78	.150			

Table 23. Number of elephant seals tagged on South Farallon Islands, 1972-1982.

YEAR	Adult male	4 SA	3 SA	2 SA	1 SA	Adult female	Imm	Pup	Total # of animals tagged
1972								1	1
1973								2	2
1974			1					5	6
1975	2		7	5		11		28	53
1976			2	3		16		56	77
1977			7	21	10	49	11	83	181
1978		2	13	22	20	62	34	98	251
1979		1	4	28	7	31	5	54	130
1980	1	8	21	33	28	51	5	137	284
1981	3	10	21	62	17	55	10	172	350
1982	2	6	16	39	10	45	6	248	372
									1707

Table 24. Tag loss in northern elephant seals tagged as adults on South Farallon Islands.

	Amount of time before tag lost	< 1 mo.	< 1 yr.	1 yr.+	2 yr.+	3 yr.+	4 yr.+
Males	(N = 59)	34	10	5	4	2	4
Females	(N = 46)	11	20	7	5	3	

Table 25. Minimum survival of elephant seals tagged as pups on South Farallon Islands, 1974-1981.

YEAR	1974				1975				1976				1977				1978			
Number of pups born	17				35				60				104				133			
	F	M	Total	%	F	M	Total	%	F	M	Total	%	F	M	Total	%	F	M	Total	%
Pups surviving to weaning (first spring)	2	3	5	29	18	10	28	80	27	29	56	93	35	49	84	81	50	49	99	74
first fall	1	2	3	18	9	5	14	40	14	11	25	42	21	22	43	41	23	24	47	35
second spring	1	2	3	18	9	4	13	37	10	11	21	35	20	19	39	38	19	20	39	29
second fall	1	2	3	18	8	4	12	34	8	10	18	30	16	16	32	31	16	12	28	21
third spring	1	2	3	18	7	4	11	31	6	7	13	22	13	15	28	27	12	11	23	18
third fall	1	2	3	18	7	4	11	31	6	6	12	20	10	9	19	18	12	10	22	17
fourth spring	1	2	3	18	7	4	11	31	6	5	11	18	8	7	15	14	11	5	16	12
fourth fall	1	2	3	18	4	4	8	23	5	5	10	17	6	5	11	11	8	4	12	9
fifth spring	1	2	3	18	4	2	6	17	5	3	8	13	6	4	10	10	6	1	7	5
fifth winter	1	2	3	18	4	1	5	14	4	2	6	10	6	3	9	9				
sixth winter	1	2	3	18	3	1	4	11	4	1	5	8								
seventh winter	1	2	3	18	3	1	4	11												
eighth winter	1	2	3	18																

YEAR	1979				1980				1981				Total	
Number of pups born	184+				232+									
	F	M	Total	%	F	M	Total	%	F	M	Total	%	Total	%
Pups surviving to weaning (first spring)			128	70	65	68	137*	59	76	83	172*	59	709	67
first fall			29	(36)**	26	25	52*	22	33	32	68*	23	318	30
second spring	10	11	21	(27)	20	19	40*	17	19	17	38*	13	246	23
second fall	9	9	18	(22)	17	12	30*	13						
third spring	8	9	17	(21)	15	12	28*	12						
third fall	6	7	13	(17)										
fourth spring	5	6	11	(14)										

* Total includes animals of unknown sex.

** Because of permit complications in 1979, only 42% (54/128) of pups surviving to weaning were tagged. All percentages have been adjusted accordingly.

Table 26. Known-age Farallon-born cows pupping on South Farallon Islands, 1978-1982.

YEAR	3 yr old	4 yr old	5 yr old	6 yr old	7 yr old	8 yr old	Average age
1978	1						
1979	0	2	1				4.3
1980	0	2	4	1			4.8
1981	1	4	2	3	1		4.9
1982	*0	7	5	3	2	1	5.1

* Because of permit complications, few pups were tagged in 1979.

Table 27. Known-age elephant seal cows pupping on South Farallon Islands, 1975-1982.

YEAR	3 yr old	4 yr old	5 yr old	6 yr old	7 yr old	8 yr old	9 yr old	10 yr old	11 yr old	12 yr old	Average age
1975	1	4	1								4.0
1976	0	6	2	1							4.4
1977	3	5	4	2	1						4.5
1978	6	7	4	5	1						4.5
1979	12	8	7	4	3	1	1				4.6
1980	4	23	10	3	3	3	0	1			4.8
1981	8	11	22	10	5	1	2	0	1		5.2
1982	*0	31	16	21	10	5	1	1	0	1	5.5

* Because of permit complications, few pups were tagged in 1979.

Figure 1. The South Farallon Islands showing haul out areas of pinnipeds.

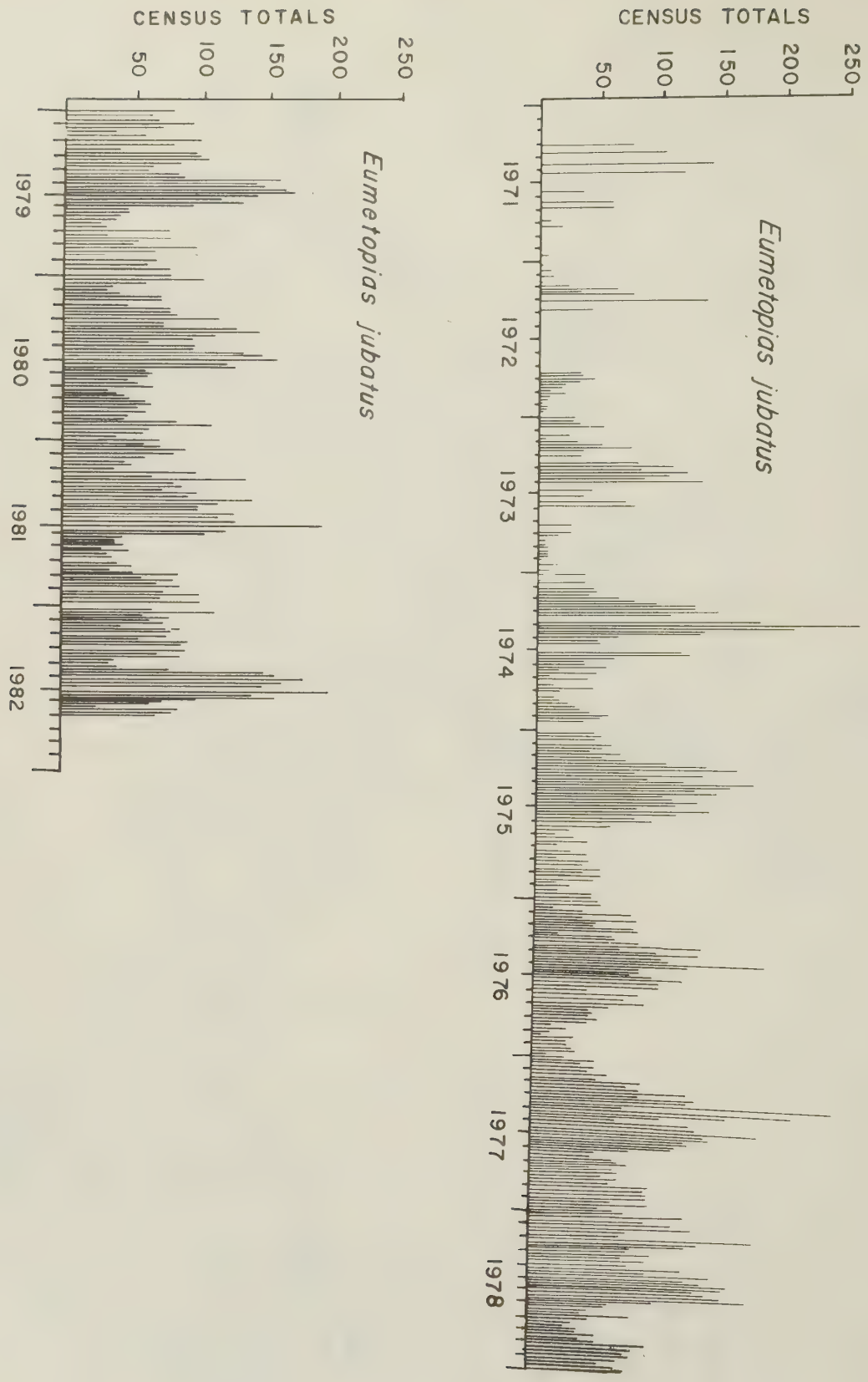

Figure 2. The occurrence of Steller (northern) sea lions (Eumetopias jubatus) at the Farallones, 1971-1982.

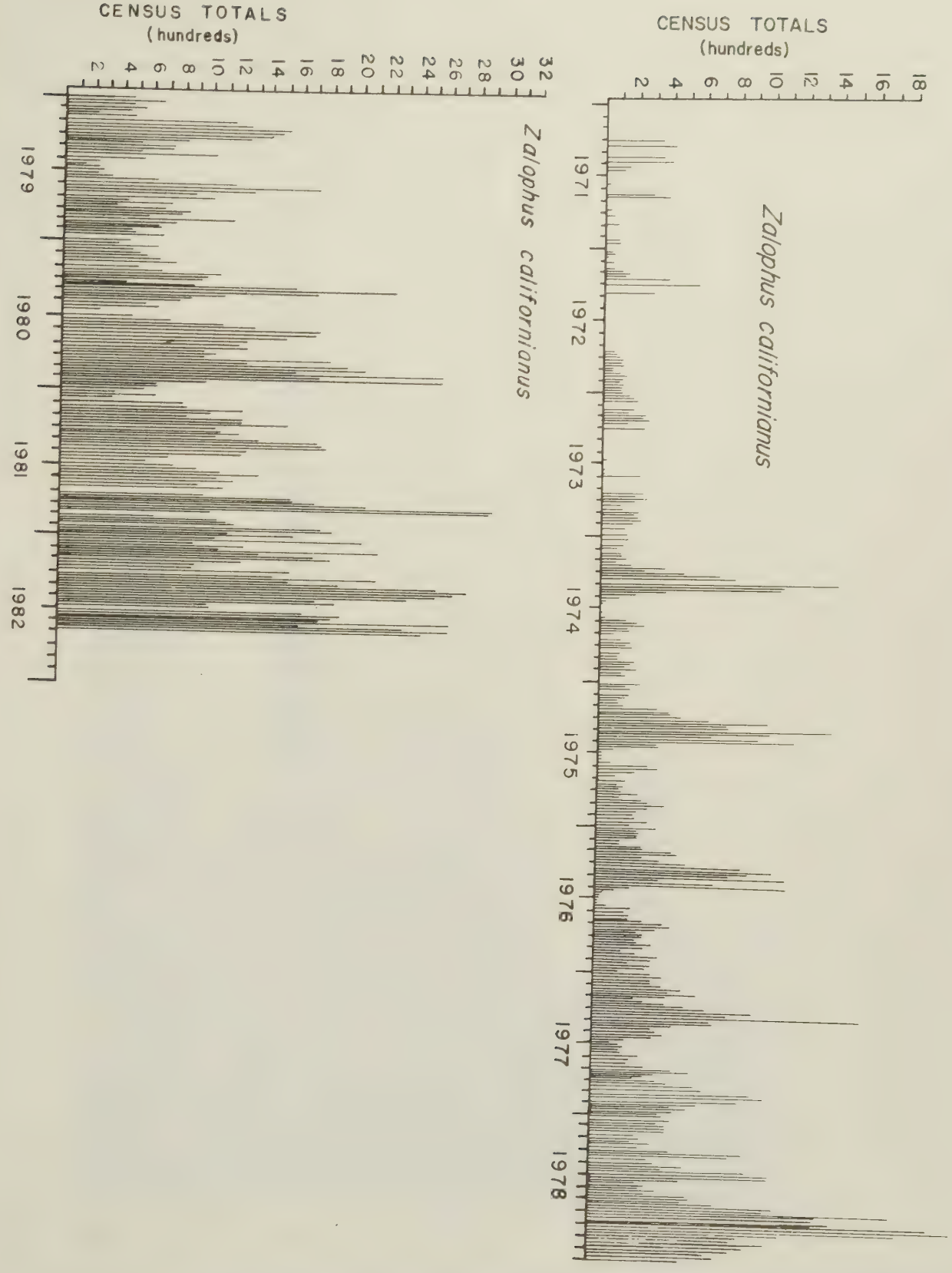

Figure 3. The occurrence of California sea lions (Zalophus californianus) at the Farallones, 1971-1982.

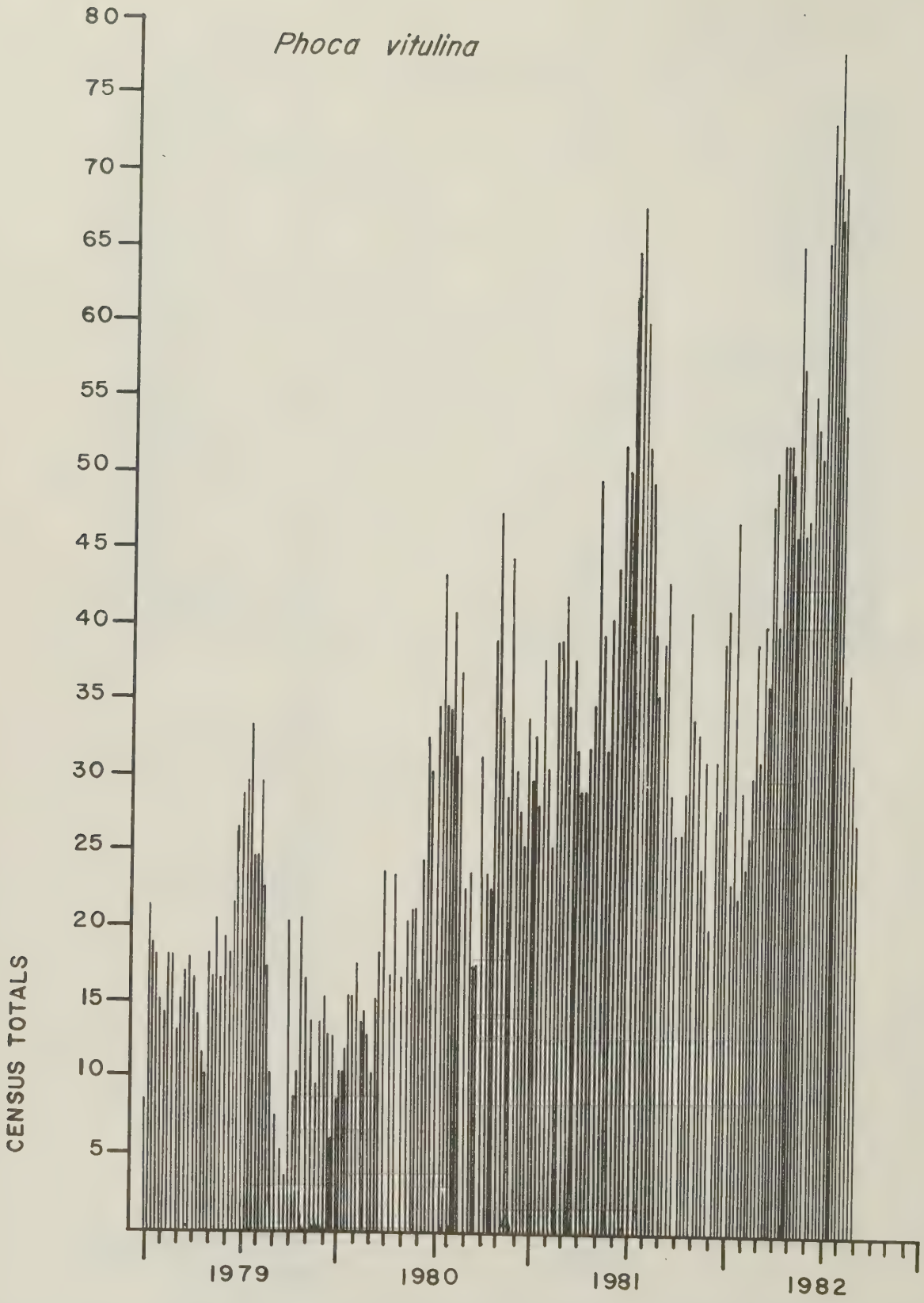

Figure 4. The occurrence of harbor seals (Phoca vitulina) at the Farallones, 1971-1982.

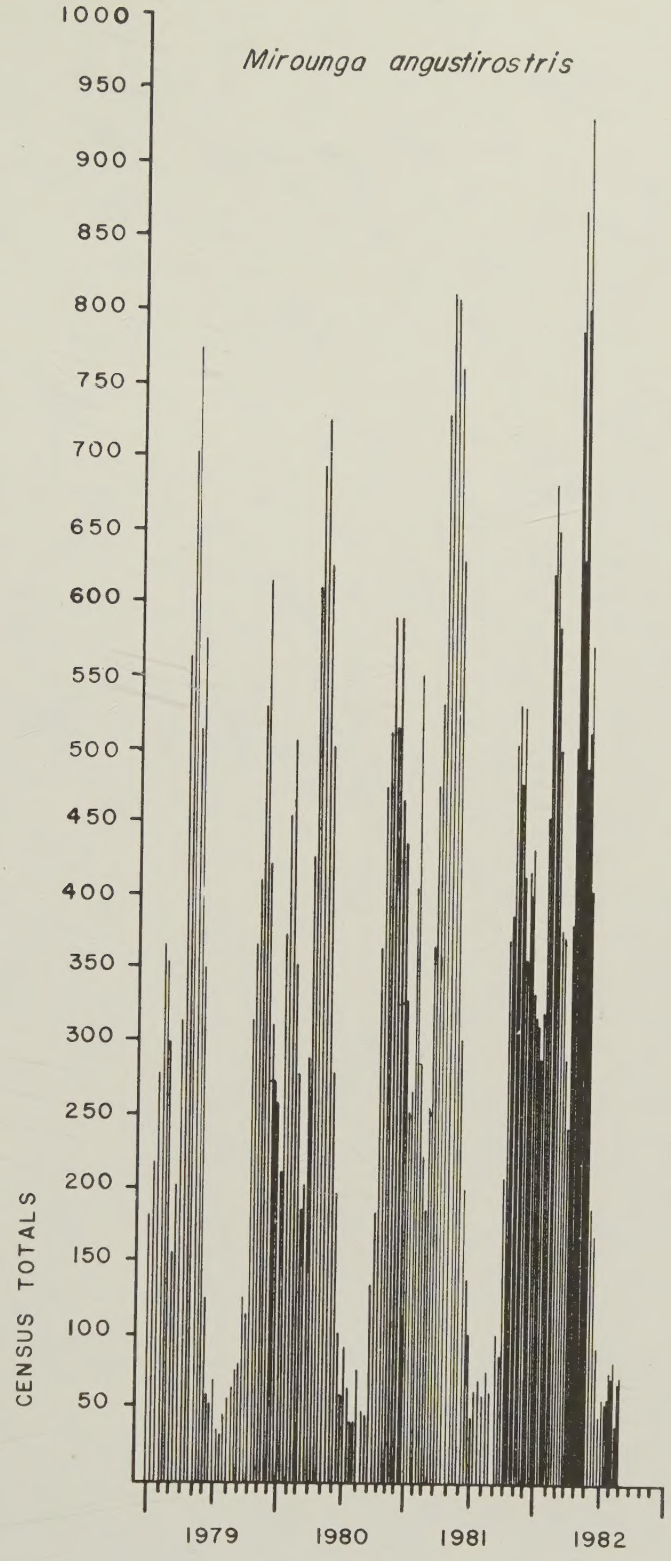

Figure 5. The occurrence of northern elephant seals (Mirounga angustirostris) at the Farallones, 1971-1982.